ENFORCEMENT CONFIDENTIAL

NEICVP0944E01

APPENDIX A

MULTIMEDIA COMPLIANCE INVESTIGATION

ABC Coke
Tarrant, Alabama
NEIC Project No.: VP0944

October 2011

NEIC PROCESS DESCRIPTION AND WASTE GENERATION

ABC Coke is a merchant foundry coke producer. The primary raw material used is coal. ABC coke operates three coke oven batteries. The Wilputte design battery (battery No. 1) has 78 five-meter ovens; the two Beckers design batteries (battery Nos. 5 and 6) have 54 four-meter ovens. Coal is placed in the coke batteries, in the absence of air, at a coking temperature of approximately 2,100 degrees Fahrenheit (°F). The coal breaks down in this destructive distillation process, creating coke oven gas (hydrogen, volatile material, etc.) and coke (primarily carbon). The volatile products from the coal and coal tar derivatives are recovered and separated in the coke by-products recovery plant. Figure 1 is a process flow diagram of the coke by-products recovery plant.

The coke oven gas (COG) is vented from the individual ovens into a collection main where flushing liquor is sprayed on the COG to cool it. Flushing liquor and condensed COG from the downcomers off the collection main are routed to the one of two tar decanters. The remaining COG that has not condensed continues on to one of two primary coolers where the COG is contacted with additional flushing liquor for further cooling to drop out the remaining condensables. The combined stream from the primary coolers is sent to a liquid collection drum where the condensed material, liquor, drops out into a seal pot, then is routed to a primary cooler sump, and is pumped to the tar decanters. The remaining COG from the liquid collection drum is sent to one of two exhausters.

FLUSHING LIQUOR, TAR, AND SLUDGE HANDLING

The tar decanters are used to separate sludge and tar from the flushing liquor. The sludge falls to the bottom of the decanter and is removed by a rake into tar decanter sludge buggies. The tar decanter sludge is taken to the “Kipin” process (discussed later) for recycling back into the coal blend sent to the coke ovens. The tar layer is routed from the tar decanters to the west tar storage tank. From the west tar storage tank, the tar is sent through the tar bottom final gas cooler, where any remaining naphthalene in the COG stream also flowing through the final gas cooler is absorbed, and then to the east tar storage tank. A process water stream in the tar bottom final gas cooler is used to cool the COG to below the temperature of the wash oil before the COG enters the light oil scrubbers. The process water, which is contained in a process water tank, is first sent through a wet surface air cooler and then through the tar bottom final gas cooler and back to the process water tank. The process water is in direct contact with the COG stream for cooling. Liquor (water and organic compounds) that builds in the process water tank is decanted to the tar decanters. Tar from the east tar storage tank is shipped to outside customers via tank truck and railcar.

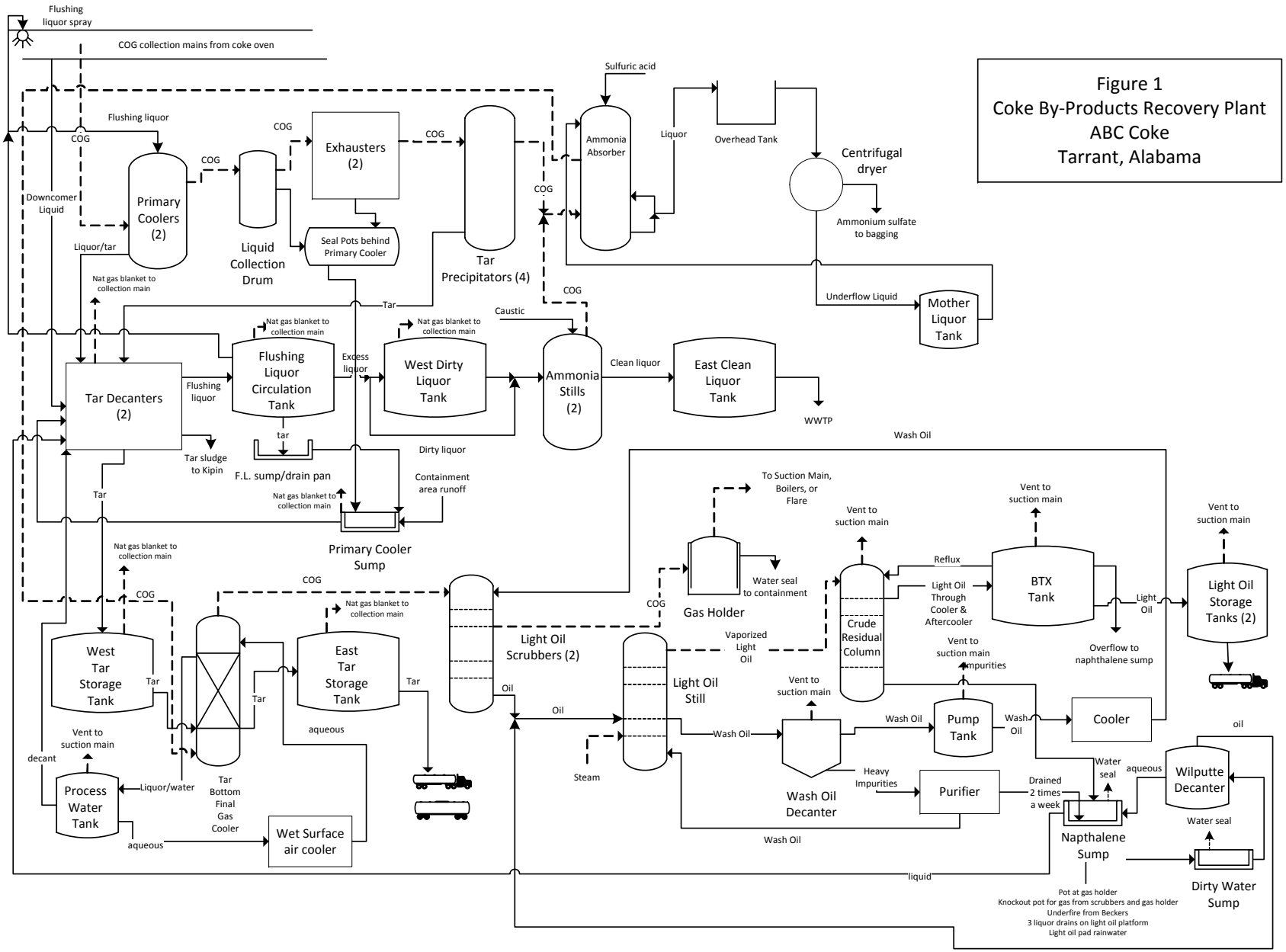
Figure 1
Coke By-Products Recovery Plant
ABC Coke
Tarrant, Alabama
Flushing liquor spray
COG collection mains from coke oven
Flushing liquor
Downcomer Liquid
Liquor/tar
Primary Coolers (2)
Liquid Collection Drum
Exhausters (2)
Seal Pots behind Primary Cooler
Tar Precipitators (4)
Sulfuric acid
Ammonia Absorber
Liquor
Overhead Tank
Centrifugal dryer
Ammonium sulfate to bagging
Underflow Liquid
Mother Liquor Tank
Nat gas blanket to collection main
Tar
COG
Caustic
Flushing Liquor Circulation Tank
Excess liquor
West Dirty Liquor Tank
Ammonia Stills (2)
Clean liquor
East Clean Liquor Tank
WWTP
Tar Decanters (2)
Flushing liquor
Tar sludge to Kipin
tar
F.L. sump/drain pan
Dirty liquor
Containment area runoff
Primary Cooler Sump
Wash Oil
To Suction Main, Boilers, or Flare
Vent to suction main
Gas Holder
Water seal to containment
Vaporized Light Oil
Crude Residual Column
Reflux
Light Oil Through Cooler & Aftercooler
BTX Tank
Light Oil
Light Oil Storage Tanks (2)
Overflow to naphthalene sump
Vent to suction main impurities
West Tar Storage Tank
East Tar Storage Tank
Light Oil Scrubbers (2)
Light Oil Still
Oil
Steam
Wash Oil
Pump Tank
Cooler
Wash Oil Decanter
Heavy Impurities
Purifier
Drained 2 times a week
Napthalene Sump
Water seal
Wilputte Decanter
aqueous
oil
Dirty Water Sump
liquid
Pot at gas holder
Knockout pot for gas from scrubbers and gas holder
Underfire from Beckers
3 liquor drains on light oil platform
Light oil pad rainwater
decant
Process Water Tank
Liquor/water
aqueous
Tar Bottom Final Gas Cooler
Wet Surface air cooler

Flushing liquor from the tar decanters is routed to the flushing liquor circulation tank. Any remaining tar collected in the flushing liquor circulation tank is sent to a flushing liquor sump (drain pan), then to the primary cooler sump, and pumped back to the tar decanters. Flushing liquor from the flushing liquor circulation tank can be routed to two locations. Some flushing liquor is recirculated back to the spray nozzles on the collection mains and reused to cool the COG. The excess flushing liquor is sent to the west dirty liquor tank (excess ammonia liquor storage tank) and then fed to one of two ammonia stills. The excess flushing liquor can also bypass the west dirty liquor tank and be fed directly to the ammonia stills. Only one ammonia still is operated at a time with the other used as a backup. The liquid from the ammonia still, clean liquor, is sent to the east clean liquor tank and then goes the wastewater treatment plant (WWTP). The vent gas stream from the ammonia still is combined with the COG stream prior to the ammonia absorber. The wastewater treatment plant operations are discussed later.

ABC Coke also operates a dirty water sump that receives the following streams: liquids from pot at gas holder; knock out pot material for gas scrubbers and gas holder; underfire from the Beckers coke ovens; three liquor drains on the light oil platform; and light oil pad rainwater. The dirty water sump pumps material to the Wilputte decanter. The aqueous stream from the Wilputte decanter is sent to the naphthalene sump. Material in the naphthalene sump is returned to the tar decanters. The oil stream is sent to the wet scrubber suction pump oil stream from the light oil scrubbers in the light oil recovery system. The dirty water sump contains a u-leg water seal for emissions control.

COG HANDLING SYSTEM

The exhausters are used to push the COG through the gas handling system. Only one exhauster is in operation at a time, with the other idling on standby. The COG is routed from the exhauster to one of four tar precipitators. Typically, all four tar precipitators are used to achieve the highest efficiency of tar mist removal. The tar is collected in tubes on the charged rods, dropped to the bottom of the precipitators, and then routed to the tar decanters. The COG then flows to the ammonia absorber for ammonia removal. The COG is contacted with sulfuric acid to generate ammonium sulfate.

The ammonium sulfate liquor is removed from the ammonia absorber, collected in an overhead tank, and then sent then to a centrifugal dryer to remove any remaining liquids. The solids are bagged and sold as fertilizer. The underflow liquid from the dryer is collected in a mother liquor tank and recirculated back to the ammonia absorber.

The COG is routed from the ammonia absorber through the tar bottom final gas cooler, where the COG is contacted with tar to remove naphthalene. The COG is then contacted with a process water stream to cool COG to below the temperature of the wash oil before it enters one

of two light oil scrubbers. In the light oil scrubbers, the COG is contacted with wash oil. The light ends (benzene, toluene, and xylene [BTX]) are pulled from the COG into the wash oil. The remaining COG continues is sent to the COG gas holder for storage, to the COG suction main for battery underfiring, to the boilers to be used as fuel, or to the flare for destruction.

The wash oil/light oil mixture is routed from the light oil scrubbers to the light oil still where steam heats the stream and separates the light oil from the wash oil by vaporizing the light oils. The vaporized light oils are sent through the crude residual column where impurities drop out and are sent to the naphthalene sump and eventually back to the tar decanters. The naphthalene sump contains a u-leg water seal for emissions control. The light oil vapor is sent through a series of two condensers for cooling and then to the BTX tank. The reflux stream from the BTX tank is sent back to the crude residual column. Water is decanted from the BTX tank and routed to the naphthalene sump. The light oil is sent to one of two light oil storage tanks for storage before it is shipped offsite via tank truck.

The wash oil is sent from the light oil still to the wash oil decanter. The wash oil is sent to a pump tank, then through a cooler, and back through the light oil scrubbers. Heavy impurities ("muck") separated out from the wash oil decanter are routed to a purifier. Any wash oil separated out of the purifier is sent to the light oil still. The muck is drained two times a week to the naphthalene sump, whose contents are then pumped to the tar decanters.

VENT COLLECTION SYSTEMS

ABC Coke uses two vent systems. They have a natural gas blanketing system on some vessels that is routed back to the COG collection main coming off the coke ovens. The tar decanters, flushing liquor circulation tank, west dirty liquor tank, tar storage tanks, and primary cooler sump are natural gas blanketed and route to the collection main. The second collection system is vent caps on some vessels that tie into the suction side of the coke batteries to use as fuel in the battery underfiring. The crude residual column, wash oil decanter, pump tank, BTX tank, process water tank, and light oil storage tanks vent to the coke battery suction for underfiring the ovens.

KIPIN RECYCLING PROCESS

Listed hazardous waste generated in the coke by-products plant and other solid wastes are recycled into the coke ovens using as process known at ABC Coke as the "Kipin" process. ABC Coke receives materials for recycling (i.e., tar decanter sludge) from facilities in Middletown, Ohio; New Jersey; and Tuscaloosa, Alabama. The materials from the coke by-products plant (i.e., tar decanter sludge) are placed into open-topped tanks called half-vats. An excavator moves the material from the half-vats into a bin that feeds an auger. In the auger, the materials from the by-products plant are mixed with coal. The mixture is dropped onto a conveyor belt

that discharges on the pad located in the south end of the process area. A front end loader is used to move the coal and by-products mixture into the chute that dumps onto the conveyor belt connected with No. 10 silo. The pad in the Kipin area is surrounded on three sides by walls constructed of large concrete blocks. There is a steel plate located near the bottom of the walls that is set into the concrete of the pad floor. The bottom of the pad is 12 inch thick concrete.

The product produced by the Kipin process is stored in the No. 10 silo for feed into the coke ovens. The Kipin product can be used in both furnace and foundry coke manufacturing.

WASTEWATER TREATMENT PLANT

The wastewater treatment plant was constructed in 1985. The ammonia still is the only process equipment that discharges to the wastewater treatment plant. The ammonia still discharges into a 250,000-gallon, east clean liquor tank. The ammonia still is sampled every 2 hours for ammonia and pH. An indirect cooler is then used to cool the influent to the equalization basin down to 150 °F. ABC Coke has two coolers available if needed.

The cooler discharges into the equalization basin, a clay-lined pond that was built in the 1970s. The basin is equipped with aerators to keep solids from settling. Some bacteria are wasted out of the basin.

The equalization basin discharges into two aerated concrete basins. The influent flows down the center of the concrete basin and then into the outside ring. Each aerated basin discharges to its own clarifier. Solids from the clarifiers are discharged to a tank and then dewatered in a filter press. Water from the filter press is discharged to the equalization basin. Solids from the filter press are handled through the Kipin process and returned to the coke ovens. The clarifier overflow discharges to the post-aeration pond to settle out any entrained solids.

The post-aeration basin is used to settle solids, which contain “benzoate pyrene,” that is not removed in the clarifiers. Ferric chloride is used to aid in the settling process. Solids were removed from the post-aeration basin 18 months before the NEIC inspection. A portable belt press was staged at the post-aeration basin and the dewatered solids were handled in the Kipin process and returned to the coke ovens.

Effluent from the post-aeration basin is sent to sand filters, followed by carbon filters for further treatment. The effluent from the carbon filters is discharged to a small tank where dissolved oxygen is added before the effluent is discharged through a National Pollutant Discharge Elimination System-permitted outfall.